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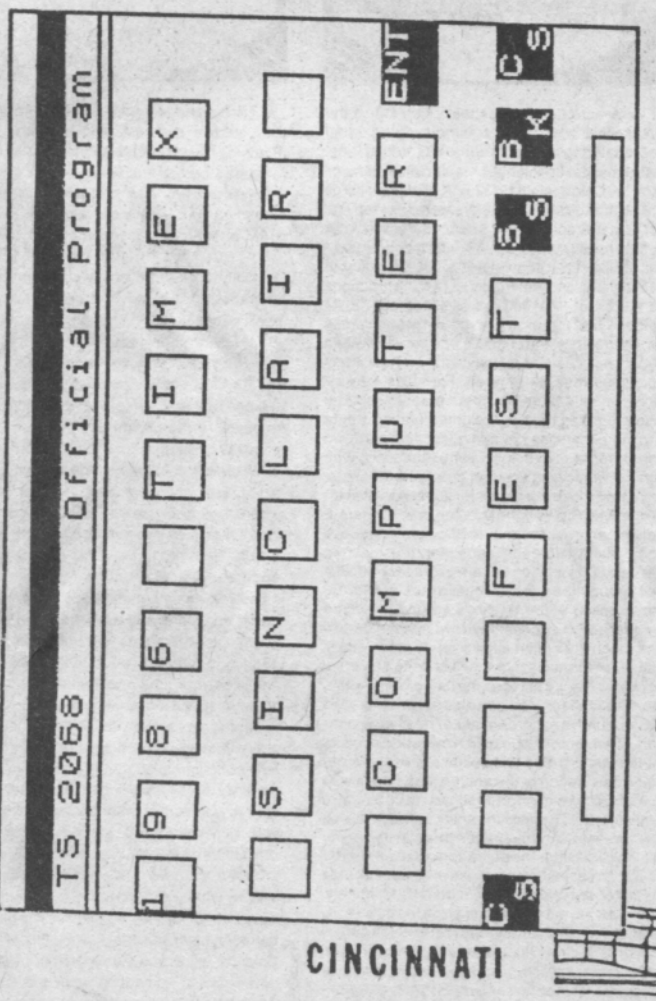
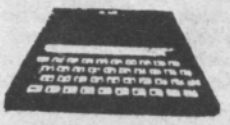
1986 MIDWEST TIMEX sinclair COMPUTER FEST

Official Program Booklet
Provided by T·S Horizons





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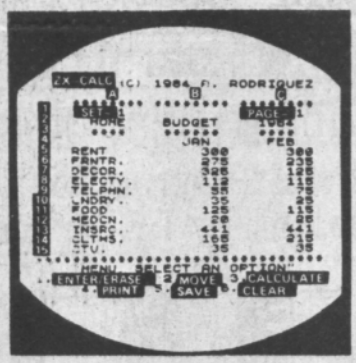
ZX-TEXT

A word processor is to a computer user what a typewriter is to a typist, except that the former has more advantages than the latter. ZX-Text can operate in 16-64K RAM providing from 1300 to 6500 words per document. It features 6 different options: write, read, edit, print, save and clear text. Text is written on a per-line basis with quick speed and with horizontal back-space and delete capabilities being available. You can also access the editor directly from write mode and vice-versa. Text can be proof-read on a per-line basis allowing for enough time to determine if any editing is needed. The text editor allows a line of text to be deleted, inserted, replaced and listed for editing. You may also change a word or expression within a line, stop or start text while it is scrolling up the screen, begin reading text from the first line of the file, re-enter write mode from the editor, return to the main-menu or create a window so that you can read-edit two files simultaneously. The print option takes text displayed in 30-column format on the screen and outputs to either the ZX/TS printer. (With Memotech's Centronics Parallel Interface 80-column and lower/higher - case output is possible.) Files may be saved on tape cassette with the use of one single command, or by the same token they can be erased from memory / storage so that the full capacity of the program can be used for other purposes such as composing letters, reports, articles, memos, standard forms, instructions, ads, graphs, telephone directory, lists of customers, members, friends...etc. Also copies of files are always less expensive and easier to run than using a photocopier. Other advantages are savings in time, paper, ink, correcting mistakes and adding afterthoughts more efficiently than doing them through either handwriting or using a typewriter.

$16.95

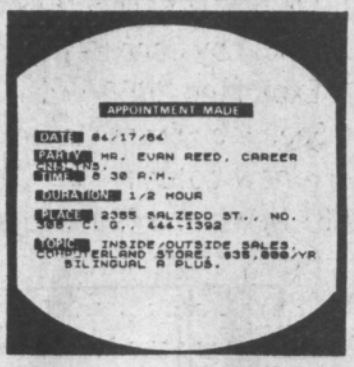
ZX-CALC



An electronic spreadsheet calculator is the fundamental basic tool for summarising, reporting and analyzing in matrix form any accounting, mathematical or scientific manipulation of numbers. ZX-Calc operates in 32-64K RAM and affords a maximum of 3360 characters / spreadsheet. The entire matrix consists of 15 columns (letters A-O) and 30 rows (numbers 1-30) with 8 characters / cell. Unlike other popular ESCs, ZX-Calc uses in calculations and within cells all 14 math functions on the ZX-81/TS1000. It offers a unique *SUM function that totals one or more rows/columns simultaneously. Parenthesis can be used within equations. There is no fixed limit on how many equations may be entered. Formulas may be stored in all 420 cells of the spreadsheet. The display affords 15 rows/colums. Loading of data into more than one cell can occur across/down one or more row/column simultaneously. With vertical windowing you can arrange a set of columns in any order, or practice using fixed-variable-alignment display formats. The menu offers 6 options: enter/erase, move, calculate, print, save and clear the spreadsheet. Enter/erase allows the entering, deletion or data alignment within a cell through the use of a mobile cursor. With the move option you may move around the entire sreadsheet to access any row, column or cell. The calculate option allows you to enter labels, values or formulas into a cell or write and enter equations that will act upon the data already within the spreadsheet. You can also enter bar graphs into a cell in this option. Absolute/relative replication, down/across a column/row, is also allowed by this option. Also this option allows the automatic calculation of the entire spreadsheet with one single command. Print allows you to output to either the ZX/TS printer the entire spreadsheet by column-sets and row-pages through use of the COPY command. The entire spreadsheet may be saved on cassette tape or you may clear all data from it or erase the program from RAM entirely. The most salient advantage provided by an ESC over specifically vertical applications software is that an ESC provides a reusable framework with which you can compose any specific financial model rather than just be limited to only one statically fixed format for storing, displaying and manipulating numerical data.

$16.95

ZX-CALENDAR



Time management is an important aspect of any serious business and personal agenda. Planning how to spend our time leaves us better prepared before and while we are spending it and we remain better organized after we finish spending it. ZX-Calendar operates in 16-64K RAM affording 25 appointments in 16K, 100 in 32K or 180 in 48K and 64K. Each appointment record holds a maximum of 220 characters. The main menu includes enter, search/check/sort, change, save, clear and print any and all appointments made on a specific date or with any party. Output to either the ZX/TS printer is permissible. This program will permit you to remember to do something or to be somewhere important by cataloging your answers to six questions that you must account for in order not to waste time when it is scarce: when, with whom, at what time, for how long, where and what are you going to discuss and conclude when you get together with someone else? The program lets you permanently originate, record, classify, search, sort, calculate, modify, summarize, obtain a written report and store your answers to the preceding questions so that you will not forget what you decide to do with your time. This program identifies your time according to when you are going to spend it and with whom you are going to share it. Through these forms of labeling appointments you are able to verify or modify how your time is budgeted without wasting ink, paper or more time trying to remember what you said to yourself or what someone else said to you or where you placed certain written messages that you now can't find. With this program you will know where you can find exactly what you need to know about where you want to and have to be, or where you have been, before you get and after you got there. Thus, ZX-Calendar will let you plan your time so that you will never have to worry about what is ahead or what came before, for you will always know, by using it, to never be caught astray by any time-frame.

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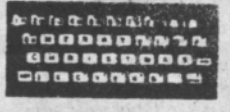
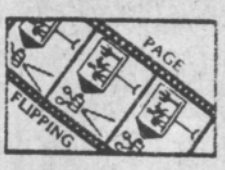
May/June 86 **T·S Horizons** No. 19

BACK ISSUES

#1 Nov'83 Creating/Saving Files (Johnson), Repeat Key and Uninterruptible Power Supply Projects, Numerical Analysis, Load/Save Problems, Reviews, and more!

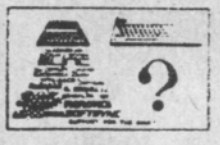


#2 Dec'83 Matrix/Cursor Input (Johnson), User-Friendliness, Reset Switch Project, Memory Reduction, Rule of 78, ZX Cash Register, Graphics Tutorial,etc!



#3 Jan/Feb'84 Two Animation Programs, Simple Loading Aid Pro. (Young), Tape File Protection, Differential Equations,Ham Radio Reviews, User Group News & More!

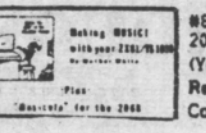
#4 March '84 The Death of TCC, TS1000 Bank Switching (Hunter), Error Recovery (Johnson), Edge Connector Schem., Simpson Rule, Reviews, Reader Input, & more!



#5 April/May'84 "WORM" Word Processor(Young) Pt.1, Least Squares, TS1000 Graphics Program, TS2068 Future?, Bank Switching Pt. 2, Program Tips, Reviews, and more!

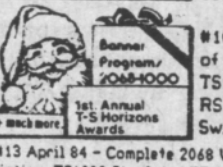
#6 June'84 Ts1000 As Church Aid, Interfacing Books, Num. Analysis, Hardware Tips, "WORM"-2, Switching-3, Good News from EA Brown, Six Reviews, and more!

#7 July/Aug'84,Telecommunications Issue, 2068 Program Tips, How A Compiler Works, Rotating Globe, Byte-Back Modem, TC for Beginner, Switching-4, WORM-3, S.I.N., etc.



#8 Sept'84 TS 1000 Music Program, 2068 Plotter, 2068 Character Set (Young), Address Program, Nine Reviews, Telecommunications Column, TS News, and more!

#9 Oct/Nov '84 - ANNIVERSARY ISSUE, TS 2068 Spirograph, Dave Higgenbottom interview, FORTH for T/S Computers, Spectrum section, Bank Switching-5, Telecommunications, Reviews, etc.



#10 Dec '84 - 40 PAGES, Making Backups of 2068 Software, Banner Programs, QL, TS1000 Program Tips,Christmas program, RS100vs.TS1000,MTermII,Horizon Awards, Switching-6, TSUGs, New Column, more!

#11 Jan'85-40 Pages, Lower Case on the TS 1000, 2068 Word Processor Eval.-Pt.1, Bar Graph, Experimenting with Byte Back Modem, Bank Switching-7, INDEX of issues 1 to 10, Reviews, and more.

#12 Feb/Mar'85 - 2068 Mass Storage, Software from England, Program Tips for TS1000, 2068 W.P. Eval.-Pt.2, Bank Switching Concluded, MTERM Patches, 2068 Tutorial, Programs.

#13 April 84 - Complete 2068 W.P. listing, TS1000 Simulated READ-DATA Worm Enhancements, User Defined Graphics for 2088,"Try These", Changing "Fonts"-2068, Reviews.

#14 May/June '85 Special HARDWARE Issue, TS1000 Keyboard Add-on, ZX81 Rampacks on the 2068,Surge Suppressor Project, User Group Report, W.P. Eval. Concluded, QL Report, Cassette Tips.

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SPECIAL REPORT #1

Midwest T/S Computer Fest A Success!!

The high point of the year, even of the last few years in the Timex/Sinclair world, has to be the great 1986 First Annual (definitely to be followed by a second!) Cincinnati T/S Computer Fest. The turnout both in terms of vendor support and number of attendees was outstanding. Early, hopeful "guess-timates" were that we might have up to 1000 attendees, but the actual number was closer to about 400. As it happened, this may have been the optimum turn-out. On Saturday, May 3, the first day of the event, the main room was quite crowded, as were many of the several seminars each day. Any more people than we had would have been too many. (Pictures from the Fest appear on pages 16 and 17.)

At any rate, the Computer Fest board (of which I was happy to be a small part) was thrilled. So were all of the vendors - who came from as far away as Oregon:

ZEBRA SYSTEMS: They were certainly the "hit" of the Fest. Zebra brought a whole van load of their complete product line, and even introduced some brand new products while there. (See reviews of BANNER and SIGN DESIGNER else where in this issue.) They had a lot of good deals and there was always a good crowd in front of their several tables.

Stewart Neufeld of ZEBRA was very busy, and he stated, on the basis of the success of the Cincinnati Fest, that he would go anywhere in U.S. for another one. He also intends to support a Fest that is being talked about for the NYC area.

KNIGHTED COMPUTER: Ray Payne of Knighted was also very busy and pleased with the turnout. They featured items for the 2068 and Spectrum, as well quite a bit for QL, including their own line of peripherals.

AERCO: Jerry Champkis of Aerco generated a lot of interest with their product line and Jerry's popular seminar on their new version of CPM for the 2068.

DAMCO: There certainly were a lot of Wafadrives under the arms of people at the Fest, so I guess Dave Macarone of Damco was happy. Actually Dave told me the interest in his whole product line was high.

RUSSELL ELECTRONICS: I was very pleased to meet the Russells. They prought a lot of products both for the 1000 and 2068.

TS CONNECTION: Of course, Jack Roberts of Cincinnati's TS Connection (he was one of the main Fest instigators) was there and he also gave a seminar on basic computer literacy.

BRICE ROAD PHARMACY: Gary Solomon came down from Columbus for the event and gave a very well-received QL-demo. It's a shame that he had so little time to spend at his booth with all of his Computer Fest responsibilities, but he was a vital part of the Fest's success.

TS HORIZONS: Richard Watts (also known as Elven Magic) and I had a blast at our table. Unfortunately we didn't sell a lot of subscriptions at the Fest because it seemed like everybody there already subscribed. We did have a chance to make a lot of new friends.

OTHER MAGS: CTM's Chet Lambert of Birmingham AL, Joe Williamson from SUM in FL, Time Designs' Tim Woods of Colton OR(!), and Tom Wood's Syncware News were all represented at the Fest.

It was a personal thrill for me to meet so many of the people I've talked to or gotten letters from for all these years. Roger Higgins stopped by - he was one of our first subscribers and he came in from Iowa for the Fest. Harvey Pulliam came all the way from Texas for the event and he told me it was 100% worth the trip. People came from all over - Florida, Georgia, the Northeast.

The Future? Plans are already in the works for next year's Fest in Cincinnati. Several other sites are also being considered for other such events in the meantime: NYC, D.C., L.A., San Francisco, and Texas have been mentioned. My recommendation is, if a group of Timex enthusiasts can bring together a staff who is willing to work, and you can get a couple of nearby user groups involved other TS Fests can be successful. Vendors now know that they can make money, and the users will come if they are made aware.

SPECIAL REPORT #2

Sinclair Research Sold to Amstrad

On April 8, 1986 the Wall Street Journal reported the sale of Sinclair Research to Amstrad Electronics, formerly their main competition in the English computer market. The Journal called it the "end of an era".

The main points of the article were:

- Purchase price: $7.3 million.
- Sale was unexpected, even though Sinclair had financial problems in the recent past.
- Amstrad makes business oriented computers, while Sinclair's forte was home models.
- Amstrad had 20% of the British home computer market; Sinclair, 40%.
- Clive Sinclair sold the computer part of his business in order to get out of debt, and get back to inventing.

LETTERS

From a Wafadriver

Dear sir, Please extend my subscription for one year. I just recieved my TSH today. It is very good. However I would like to see more notes on Spectrum compatibility. I use my 2068 in Spectrum mode 99% of the time. I have a Wafadrive and would like information or notes if the programs can be saved to wafer, etc. The other drives and interfaces are always noted but never the Wafadrive. I use their port to print to an Epson-like printer (Blue Chip). Keep going and good luck.

Robert Steensen, West Palm Beach, FL

Dear Robert, Thank you for your comments. I think you'll be interested in a column

debuting in TS Horizons in this issue. "In Spec" is a new feature for Spectrum and Wafadrive users, written by Frank Davis, mastermind behind the Midwest TS Computer Fest. The initial installment is a review of Damco's program Trans Express for "Wafadrivers". Among articles planned for future issues is a collection hints and tips for the Wafa. Check it out.

Right To Life Ad in #18

We received five letters of complaint concerning the pro-life message that appeared in TSH #18. We appreciate the concern and I suppose some points in these letters are quite valid. However I would like to indulge myself and answer some of these points individually.

> Dear TSH,
> Your publication has, in general, the best product information, program reviews, and programs of any magazine I've seen since SYNC died. The only criticism I might offer is in reference to the "Remember the Babies" graphic in issue #18. However strong someone's personal beliefs may be on the issue of abortion, a computer magazine is no place to voice those beliefs. If I want information on the political issues of the day, I'll seek it in the appropriate forum. If a message similar to that one appears in consequent issues, this subscription will definitely be my last. Otherwise, keep up the good work. Sincerely, John Nicholson, Greenfield, MA

Dear John, Thank you for your letter. If no more items on the subject of abortion appear it will be because of the reasoning you have presented, despite the fact that I consider the abortion issue to transcend the political. Perhaps an ad telling the number of abortions that take place in the U.S. is not appropriate in a computer magazine. But then perhaps Newsweek shouldn't print free ads telling people that they should Quit Smoking. After all, it's definitely a political issue. It's also a controversial, moral,and health-related issue. And I suppose many people are offended by such ads. In my opinion, Ohio Right-To-Life is a worthy, non-profit organization with an important message. I have been told that if I don't like a particular TV show, I can always change the channel. If you don't happen to like the message, you can turn the page, my friend.

> Dear TS Horizons Editor:
> Please cancel my subscription. No need to refund anything, even if it's due. Mailing label is enclosed. I've enjoyed TS Horizons until last issue, which contained a distorted political entry on abortion, unprecedented in a computer-related publication. The ignorant anti-choice entry left a bad taste in my mouth & I know I won't bother to read TS Horizons again; therefore the cancellation. H. L., MA

Dear Hillel, Have you ever noticed that every person who is in favor of abortion has already been born? By the way, what was so "ignorant" about the ad in issue 18? I'm sure the figures are right (Over 1.5 million abortions a year - compared to about 4 million live births per yer.) Maybe the terminology is ignorant? But if we can talk about the "war" on drugs, the "war" on crime. or the "war" on pornography, can't we talk about the "War on the Unborn?" By the way, your subscription expired with issue 13.

> Dear Sir, I have enjoyed your publication ever since I first discovered it. Its value... is too obvious to need additional comment or praise. Which is why I was very much disturbed to find the ad from "Ohio Right To Life" in your April issue. Most special interest publications such as TSH make a point of limiting advertising content to the chosen subject, and for good reason. Introducing unrelated political issues of this sort...serves no useful purpose and carries the possibility of alienating part of your readership. I assume that the ad in question was paid for, and that someone on your staff is not intentionally misusing the magazine to push personal views. I do think that accepting it was an error in judgement, and hope that future issues of TSH will continue to deal exclusively with TS computing, both in contents and advertising.
> Very truly yours, Lamont Downs, Las Vegas

Dear Lamont, I appreciate your advice and concern. I don't actually have a staff (even though I use the editorial "we" pretty freely in these pages) and the ad was certainly not paid for. In fact, I spend a considerable amount of time working for the local Pro-Life group raising money for literature, advertising, etc. I would never charge for a pro-life ad in my own publication.

> Nobody favors abortions! Some folks prefer to leave the options open if needed for desperation. I'd just rather you'd stick to your good job of TS reporting and avoid the politics - unless, of course, you want to rail against all nuclear weapons. I agree with Ozzie Osborn that nuclear war is the ultimate sin.
> Jack Fogarty

I am forever in your debt, Jack. You've shown me what may be the only thing that Ozzie and I could possibly agree on. I wish I could believe as you do that abortion is only a last resort for unfortunate women. The facts are that over 60% of all abortions are performed on white, middle- to upper-class women between the ages of 25 and 35, i.e., convenience. By the way, Planned Parenthood favors abortion - it's a multi-million dollar industry for them. Anyway thank you for the kind words.

I appreciate your bearing with me through the preceeding. I suppose it only added insult to insult for many of you who did not appreciate the original. One thing that disappointed me was that I didn't receive any letters of support for printing the ad. Perhaps even the people that agree with the message did not think it was appropriate in a computer magazine. Whatever the reason, of all the people I talked to earlier this month at the Cincinnati Computer Fest, nobody even mentioned the ad, so I feel that most people were not as offended as those who wrote in.

[Addendum: At the last moment before going to press we did receive a letter of support which is very much appreciated.

> Dear TS Hor-izons:
>
> I was very surprised to see the anti-abotion ad in issue number 18. Because it almost seems out of place , I predict you may "take some heat" from some of your readers, particularly those with opposing views. Even people opposed to abortion may suggest you should stick to computers and avoid controversial issues.
> This is not the case. Abortion is a national malady of the first magnitude, which needs to be opposed on every front. Among the million and a half babies killed each year, there must be a significant number of people who would have been leaders and experts in every field, including computers. These aborted lives are a loss to every area of human achievement.
> I salute your courage, and pray that "Remember the Babies" gives pause for more than a few of your subscribers.
> Sincerely, Ted Shutes, Vermontville, MI

Dear Ted, Thank you. Your point is very well made. If abortion had been an alternative for say, Mrs. Sinclair, forty-some years ago and if her pregnancy had been somehow inconvenient, perhaps there would be no Clive Sinclair today. And no ZX81, Spectrum, TS 2068, QL, or even TS Horizons.
TSH]

For the TS 2068 or the TS1000/ZX81

SOLUTION OF QUADRATIC EQUATIONS

From the book "Small User's Math"
by Ken Lewis, Ph.D.

The famous quadratic formula allows an easy and direct solution of any quadratic equation in the standard form $ax^2 + bx + c = 0$. The formula computes the two roots of this equation in terms of the coefficients a, b, and c:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad (1)$$

THE PROGRAM

The program uses equation (1) above to compute the roots of the equation $ax^2 + bx + c = 0$. Provisions are made to allow complex and double root as well as real, distinct root computation, with a message indicating which category a particular problem falls into.

In order to use the program, the "RUN" mode is entered. Immediately, the program prompts "INPUT A", "INPUT B", and "INPUT C", corresponding to the a, b, and c of the quadratic equation in standard form, respectively. Once these are entered, the program executes and prints out the answer(s).

```
 10    REM QUADRTC
 20    REM THIS PROGRAM SOLVES
 30    REM A QUADRATIC EQUATION
 40    PRINT "INPUT A"
 50    INPUT A
 60    PRINT "INPUT B"
 70    INPUT B
 80    PRINT "INPUT C"
 90    INPUT C
 95    CLS
100    LET D=-B/(2*A)
110    REM COMPUTE DISCRIMINANT
120    LET DSCRM=B*B-4*A*C
130    IF DSCRM>=0 THEN GOTO 180
135    PRINT "THE ROOTS ARE COMPLEX:"
140    LET DSCRM=-DSCRM
145    LET R=(SQR (DSCRM))/(2*A)
150    PRINT D;"+";R;"*I"
155    PRINT D;"-";R;"*I"
160    GOTO 300
180    IF DSCRM>0 THEN GOTO 205
185    PRINT "THERE IS A DOUBLE ROOT"
190    PRINT D
200    GOTO 300
205    PRINT "THERE ARE TWO REAL ROOTS"
210    LET R=((SQR DSCRM))/(2*A)
220    PRINT D+R;"    ";D-R
300    STOP
```

EXAMPLE

Find the roots of $3x^2 - 4x + 1 = 0$. Enter the "RUN" mode. The prompt "INPUT A" is responded to by entering 3. The next prompt "INPUT B" is answered by putting in -4. The final prompt "INPUT C" is responded to by entering 1. The answer then appears:

```
THERE ARE TWO REAL ROOTS
 1          0.3333333
```

EXAMPLE

Find the roots of $x^2 - x + 4 = 0$. Enter the "RUN" mode. Here, A = 1, B = -1, and C = 4. These values are entered in their turn. The answer appears:

```
THE ROOTS ARE COMPLEX:
 0.5 + 1.9365*I
 0.5 - 1.9365*I
```

TSH

[Ed. Note: This article is an excerpt from the book **"Small User's Math"** or **"S.U.M."** by Ken Lewis, former **TS Horizons** author. **S.U.M.** includes several curve-fitting programs, some powerful matrix programs, programs for solving differential equations, and more.]

"In Sync"

Exploring 2068 Video Modes

by John Bell

One of the reasons I bought a 2068 was to use the advanced video modes described in appendix C of the basic manual. I was disappointed when I found it impossible to access these modes using only BASIC. After learning machine code I was able to use the Dual Screen Mode in my BASIC programs. The following listing uses the 2 screens to do simple straight line animation to demonstrate this mode. You will have to do a little programming to change the pictures that will be drawn, but that should present no problem for most readers. Once you type in the program, save it before you run it. The program uses a short machine code routine and if you made a typing error, the program might crash. There is an error checking routine in the program, but it will not detect transposed digits. When you run this program don't use the BREAK key, because if you do the computer will "hang". Most of the time the computer is displaying the 2nd screen and if there is an error message it will be printed on the first screen, you will not see it. If you can't resist hitting the BREAK key, be prepared to enter OUT 255,0 "blind" in order to switch to screen 1. Try running the program to see what it draws.

CHANGING THE PROGRAM; The only programming change you will have to make is in the three DATA statements. The first number is how many "frames" the program will draw. The second digit is the number of DRAW statements it takes to make the picture. The second DATA statement contains the PLOT and DRAW coordinates to create the first frame. The third DATA statement contains the information to draw the last frame. The computer works out all the intermediate frames. Please note that you must start your drawing with a PLOT and use only DRAW statements thereafter. You also must have the same number of lines in the first and last drawings. Have fun with the program. Next issue I'll have two programs that manipulate REM statements.

TSH

```
  1 REM triangle to square
100 DATA 20,4
105 REM
    DATA STATEMENTS CONTAIN THE
    COORDINATES OF THE PLOT AND
    DRAW STATEMENTS
110 DATA 70,40,100,0,0,100,-100
,0,0,-100
120 DATA 70,40,100,0,-50,87,-25
,-44,-25,-43
130 REM
    SET UP M-C
140 GO SUB 520
150 REM
    SETS DUAL SCREEN MODE
160 RANDOMIZE USR 60000: OUT 25
5,1
170 RESTORE 100
180 REM
    INITALIZES VARIABLES
190 READ FRAMES
200 READ POINTS
205 LET POINTS=POINTS+1
210 DIM A(POINTS,2)
220 DIM B(POINTS,2)
230 FOR A=1 TO POINTS
240 READ A(A,1): READ A(A,2)
250 NEXT A
260 FOR A=1 TO POINTS
270 READ B(A,1): READ B(A,2)
280 NEXT A
290 REM
    MAKES THE "B" ARRAY CONTAIN
    THE OFFSET OF OFFSET OF
    EACH PLOT-DRAW POINT
300 FOR A=1 TO POINTS
310 LET B=(B(A,1)-A(A,1))
320 LET B(A,1)=B/(FRAMES-1)
330 LET B=(B(A,2)-A(A,2))
340 LET B(A,2)=B/(FRAMES-1)
350 NEXT A
360 REM
    DRAWS EACH FRAME OF
    THE PICTURE
370 FOR A=1 TO FRAMES
380 CLS
390 PLOT A(1,1),A(1,2)
400 FOR C=2 TO POINTS
410 DRAW A(C,1),A(C,2)
420 NEXT C
430 OUT 255,0: RANDOMIZE USR 60
041: OUT 255,1
440 REM
    CHANGES COORDINATES FOR
    NEXT FRAME
450 FOR B=1 TO POINTS
460 LET A(B,1)=A(B,1)+B(B,1)
470 LET A(B,2)=A(B,2)+B(B,2)
480 NEXT B
490 NEXT A
500 OUT 255,0
510 STOP
520 REM
    POKES MACHINE CODE
530 RESTORE 600
540 LET C=0
550 FOR A=60000 TO 60052
560 READ B: POKE A,B
570 LET C=C+B
580 NEXT A
590 IF C<>7805 THEN STOP
600 RETURN
610 DATA 62,128,243,245,219,255
,203,255,211,255,219,244,50,72,2
38,62,1,211,244,241,205,142,14,6
2,128,50,194,92,58,72,238,211,24
4,219,255,203,191,211,255,251,0,
33,0,64,17,0,96,1,0,27,237,176,2
01
9998 STOP
9999 SAVE *"ANIM" LINE 1
```

"In Spec"

The Spectrum/Wafadrive Column Reviews, etc. by Frank Davis

TRANS-EXPRESS
by Romantic Robot

Available from: Damco Enterprises
67 Bradley Ct.
Fall River, MA 02720

[Editor's Note: Frank originally submitted this article as a merely a product review. However at the Cincinnati TS Computer Fest, I convinced him to allow it to be printed as the first installment of a new column, which I have taken the liberty of naming "**In Spec.**" The subject matter for the column will largely concern Rotronics Wafadrive users (or as Frank says "Wafadrivers"), however "non-Wafa" Spectrum products will also be covered. Having said all that, I will now let Frank have the floor.]

Being an avid user of the Rotronics Wafadrive, when I first read about the Trans-Express program in Sinclair User I could hardly wait to get it so I could relieve myself of the tedium involved in the transferring of programs from tape to wafer.

Romantic Robot, like far too many software companies could use some lessons on how to document programs. There is one sheet of instructions that come with the program, but you will be better off by first loading the program and hitting the key for instructions when you get the program. Next take a little time and go through the on-screen instructions for each of the different features of the program; then pick a Spectrum program and try it out.

There are two main things you will find you can do with the program. The first is transfer programs from tape to wafer... but not all programs. The main problem with this is that the Wafadrive uses a bit over 2K of the computer's memory for itself, so that programs that use a lot of memory will not transfer. Vu-File transferred with no problem at all, but Strontium Dog had no chance from the start. Most all BASIC and other fairly simple programs will transfer with relative ease and all you will have to do is follow the on-screen directions and operate your tape player, by starting and stopping and rewinding when asked.

The other main feature is the tape-to-tape use of the program to make back-up copies. The first method can be used for up to 40K programs and a no-frills version is included for programs that are longer than that(48.4K).

All of the methods involved, except the "no-frills tape back-up" will give you the option to rename the program if you should desire.

Given the lack of adequate documentation this is still a fairly good program, but far from what Romantic Robot could come up with. An example of this is seen on the carton the program came in. It tells you that you can do wafer-to-wafer and disc-to-disc transfers, but upon examining the program I find that Romantic Robot decided not to include these goodies, due to the fact, I am told, that you could then make copies of the Trans-Express program itself. A back-up program that does not allow you to make a back-up of itself? Given these draw-backs to the program I would still recommend it to those who have little or no interest in going to the time and work needed to put all of your tape programs on wafer. After all, this was the reason so many of us Wafadrivers bought the machine in the first place (besides the Spectrum buss, centronics interface and the serial interface).

TSH

ZX 81 NEWS AND RESOURCES

BY PETER McMULLIN

There's lots of new stuff for the ZX81 hobbyist this month! Several issues back, I mentioned the LARKEN Disk system. Well, IT'S READY!!!

NEW ZX81/TS1000 DISK SYSTEM from LARKEN ELECTRONICS

The timing of this is rather interesting, since I've had my Aerco system for a while and reviewed it (the Aerco) last issue. A couple weeks ago, I got a phone call from Larry Kenny (the man behind Larken Electronics), announcing that his controller and ZX/LDOS is now available. Although I haven't ordered mine yet, Larry gave me a thorough description of the system over the phone, so I'll try to relate the pertinent details accurately.

First, the address: LARKEN ELECTRONICS, R.R.#2, NAVAN, ONT., CANADA K4B 1H9

The price? $120.00 CAN + $4.00 shipping for Canadian orders. U.S. customers pay U.S. $95.00 + $6.00 shipping.

That's right, for a lousy hundred of Uncle Sam's smackers, you've got a FDC and DOS for virtually HALF the price of either the AERCO or COMPUSA systems.

What about the DOS?? Well, you may have been wondering why I'm so excited about the LARKEN when I already have an AERCO Disk system. The ZX-LDOS makes the AERCO DOS seem shamefully incomplete and primitive. It is, indeed somewhat more powerful than the COMPUSA DOS.

Larken's 2068/Spectrum disk drive system has been available for several months, and seems to have received almost universally good reviews, especially in terms of value per dollar (same price as ZX system). The ZX-LDOS provides commands identical to the 2068 version, with a single USR entry.

Commands include DIRECTORY, FORMAT, LOAD, SAVE, DELETE, COPY, EXIT, MOVE*, and BADBLOCKS* (I'm not dead sure about the last two, as they are in an expanded version of the 2068 LDOS). PROGRAMS with variables, DATA (specified variables or arrays), and blocks of CODE may be saved and loaded.

Up to 54 files may be stored on one disk. The disk format is identical to the 2068 version, so CODE files saved on a 2068 may be loaded by a ZX81, or vice versa!!

The Directory is automatic and disk space is allocated dynamically. If you DELETE a short program or file, a longer file saved next will fill in the short empty space, then continue in the next available space. Programs are auto-verified and recorded with a checksum. If a loaded file has a bad checksum, the DOS will try reloading the file 10 times before giving up.

The LARKEN contoller card has 2K onboard buffer RAM mapped at 12-14K, with the actual DOS in a 2K EPROM at 14-16K. The Disk I/O port addresses don't conflict with any other hardware peripherals that I know of.

This all has me itching to get the Larken DOS and relegate the AERCO to my "second" computer. For little over $100, I can upgrade to LDOS, since it is compatible with the DSDD drives and power supplies I already have for the AERCO.

[Editor's Note: Since he wrote this article Peter has received his Larken Disk System, and is quite pleased with it. He plans to do complete reviews of the Larken System and JOBASIC (see below) in upcoming articles.]

XMODEM UPDATES

Since receiving my 2050 modem(s) from Dave Clifford Associates, I have had some fun accessing bulletin boards, and swapping text files with friends who use IBMs (there's no accounting for taste!) among other things, and have made some observations I'd like to share.

First the modem seems to be prone to bus loading problems on certain machines. I tried using the modem on my main ZX81-based computer with JLO motherboard and full-sized keyboard, with little success. I couldn't get the modem to acknowledge any incoming signal.

The same modem, connected to a TS 1500 worked fine immediately. It also worked fine on another unmodified ZX81 with a Hunter board and a Memotech 64K ram attached. I have heard other reports of the 2050 not working with ZX81s with full-sized keyboard wiring added. Comments, anyone?

That shielded ribbon cable and the ferrite beads all look suspicious to me. I have had previous "bad experiences" with ribbon cable hook-ups. My plan is to mount a small male edge connector right on the 2050 board at its connector area, connected with short wirewrap jumpers. Then the modem card can (vertically) plug right into my JLO motherboard, eliminating the ribbon cable ordeal. I'll keep you posted on how this works.

A further noteworthy point is that although the 2050 modem and the JLO Video Upgrade don't directly conflict over port adresses, the JLO Video Board "A" seems to need additional decoding: running Mini XMODEM puts sprites up on my screen! Speaking of port conflicts, the other big "no-no combo" is the JLO Video

Upgrade and the AERCO CPI. The AERCO CPI and JLO fight directly over the use of port 7F, so cannot be used together.

On the software side, I've made a few observations on Mini XMODEM 1.7. The manual I received claims to apply to both the 1.5 and 1.7 versions of Xmodem, however ambiguities seems to abound. First of all, the addresses given for changing word parameters are wrong. I found that the correct data addresses are 14790 in the "24K" version, and 31174 in the 16K version (Westridge), for setting data bits, stop and parity.

On experimenting with some XMODEM up/downloading, I discovered some interesting things. First, even if you have 64K RAM attached (thus theoretically about 47K available for downloading), the program will only download a 15K file. I plan to peek around with HOT Z to try to patch in a fix for this.

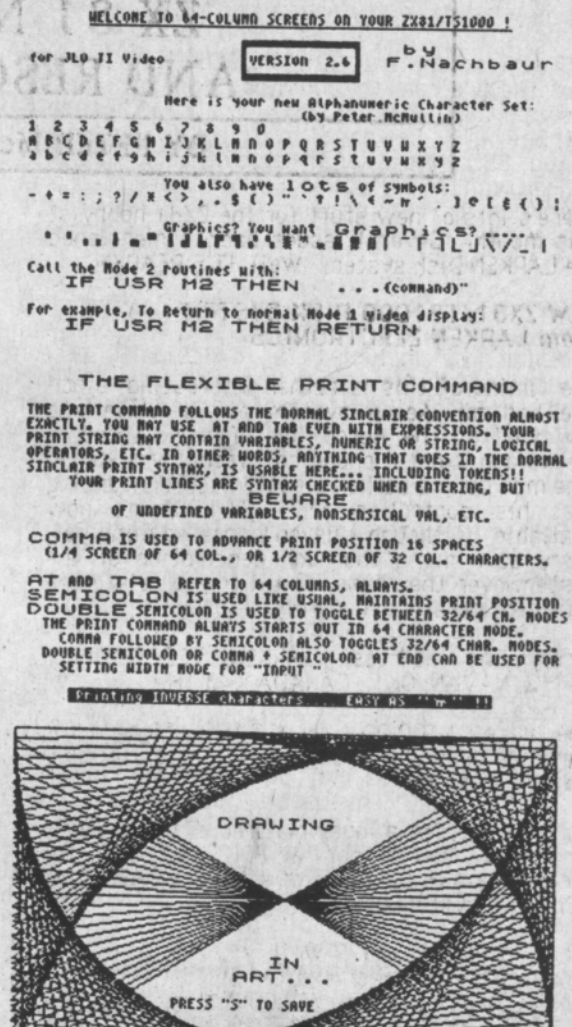
After downloading a 3.5 K long ASCII text file from a friend's PC clone, I sent it back to him to verify our setup. The Mini XMODEM didn't stop uploading at the end-of-file marker: it sent the entire file buffer (the desired 3.5K of text plus 11.5 K of ASCII BackSpaces !!). Further testing revealed that Mini XMODEM seems to send "all it's got" every time. This is wasteful of phone time, and storage space at the receiving end.

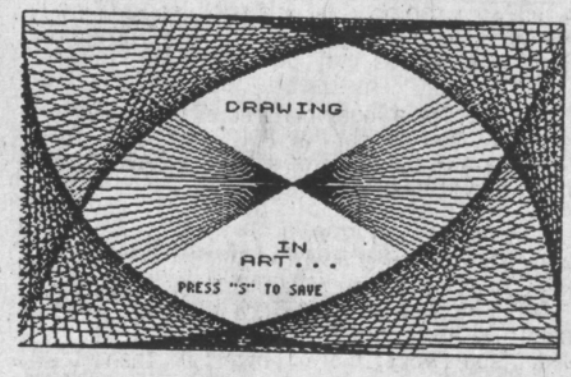
Another idiosyncracy seems to be that no choice is provided for specifying ASCII or Sinclair codes when uploading a file. Exchanging XMODEM downloaded files is no problem. But when I simply received a text file in the terminal mode (with SAVE TOGGLE on), and then uploaded it back to the sender, he received it as a Sinclair file. Rather unreadable on an IBM PC. These considerations aside, Mini XMODEM still impresses me as a powerful piece of communications software. I hope to relocate the low memory version to run at $2000-$2E00 instead of at $3300-$3F40, which conflicts with AERCO, COMPUSA, and LARKEN DOS's, and perhaps even write in a DOS access which would permit one to save a full buffer to disk without going offline.

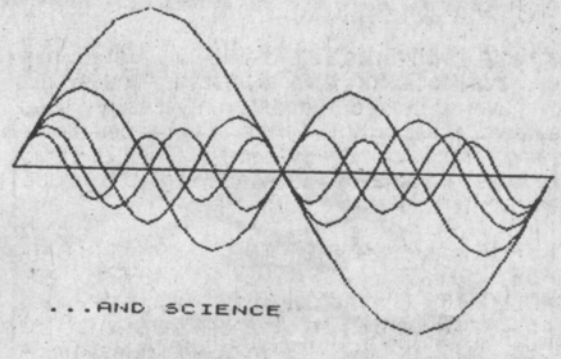
If anyone has any comments, answers, suggestions, questions, etc. relating to the Westridge 2050/ Mini XMODEM 1.7 aspects related above, please get in contact with me at **2340 Queen St. E., Toronto, ONT., Canada M4E 1G9**. I'd really like to hear from you.

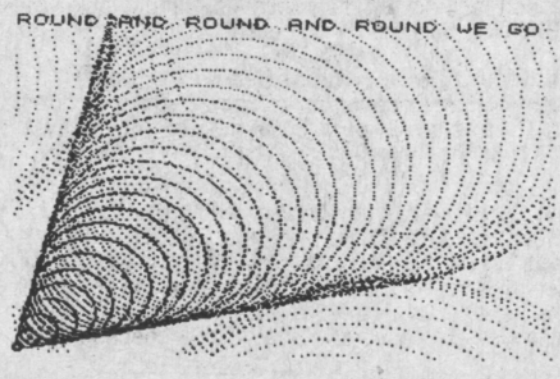
SILICON MOUNTAIN COMPUTERS

Fred Nachbaur has been hard at work writing some fancy software for the ZX81/TS1000 with the JLO Video Upgrade. Now available is JOBASIC: a relocatable 4K extended BASIC interpreter for use with the Video Upgrade. JOBASIC provides 64 column screens, 256*192 plot, draw, and circle commands, up to 256 UDGsd plus 128 printable characters plus their inverses, 32 sprites, 15 colors, 32*192 color resolution, and full 2040 printer support. Fred is providing a service called JOBASIC EXCHANGE, an applications and programs forum for JOBASIC users.









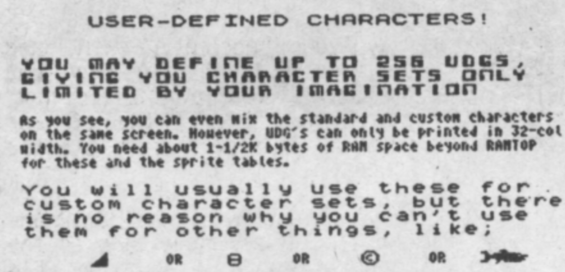
Graphics fanciers: JO-MANDELBROT, a version of the program for plotting Mandelbrot Sets*, so popular on the Amiga, is now available. (*See A. K. Dewdney, in Scientific American, Aug. '85.) A FRACTALS implementation has also been written for JOBASIC. Both these programs provide hi res graphics with 8 times the verticle color resolution that can be attained on the 2068!

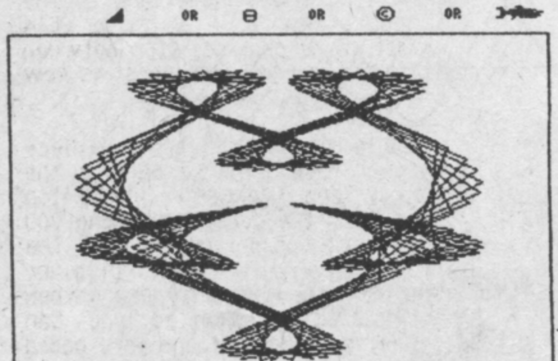
For more information about these programs, as well as several tape/disk versions of Memotext, including a 64-column screen version for the Video Upgrade, Video EPROM improvements, and several unique products for the ZX81/TS1000, write Fred Nachbaur, c/o SILICON MOUNTAIN COMPUTERS, Mtn. Stn. Group Box C12, Nelson, B.C. Canada V1L 5P1.

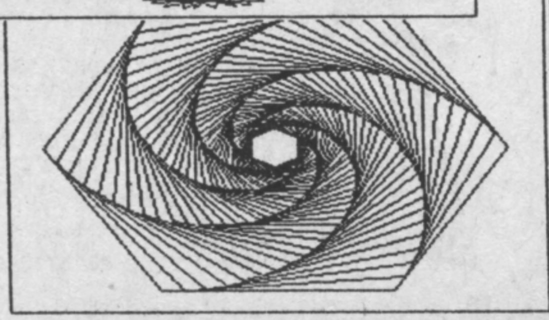
Rather than give a more detailed description of JOBASIC's capabilities, here are some screendumps from the DEMO program provided with JOBASIC. Although they show the pixel definition of the screen, its a shame you can't see the colors.

APOLOGY TO READERS:

Several TS HORIZONS readers who have kindly sent me letters may be wondering whether I really exist. I'm usually so swamped with various projects, software orders, etc., that regular correspondence often gets put on the back burner for lengthy periods. I do reply to all correspondence, sometimes it just takes an embarrassing length of time. TSH







Revising a Hunter Board to Hold 32 K Bank Switchable NVRAM

by Walter Komlosy

With HM6264LP-15 28 pin RAMS at less than $4 each, I have devised a not-too-difficult revision to a Hunter board which will give your ZX81/TS1000 four switchable 8K sections of write-protected NVRAM on the one board.

It is a very unsophisticated creation, since the bank selection and protection are all done by hand with a single dipswitch having a minimum of five SPST switches. The rewiring of the board is easy but the wiring to socket pins 2, 27, and 28 will require a steady hand, a very miniature soldering iron tip and patience.

Parts required are minimal and consist of :

4 Hitachi HM6264LP-15 I.C.
4 28 pin solder tail sockets
1 Dipswitch (5, 6, 8 SPST)
4 .1/15V Mini ceramic caps
4 ft of 24/26 wire.
4 ft Teflon tubing for above.
1 4700 ohm 1/4 W resistor.
A small piece .1" vero board.
The usual mini tools for PC board work.

Assuming you have a NVRAM Hunter board with lithium battery back-up, first remove the 6116LP3 2K RAMs from the 24 pin sockets.

Remove the LS139 decoder from the socket and either bend out or cut off pins 9, 10, 11, 12, and 13; then reinsert it in the decoder socket.

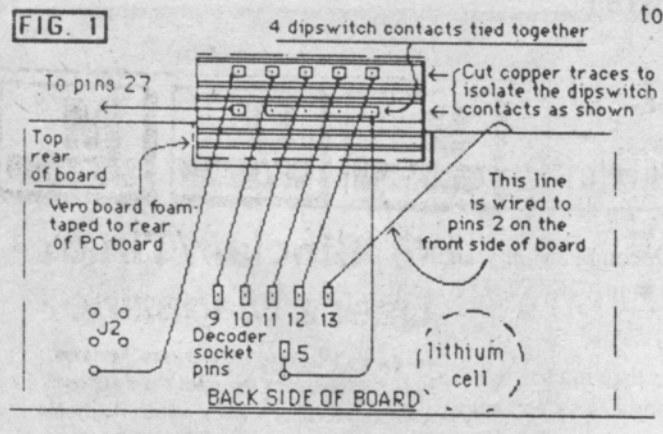
Remove any jumpers in J-1, J-2, J-3, J-5, and J-6 and cut off the two capacitors at the top of the board; then install the jumper in J-2 as shown in Fig .1.

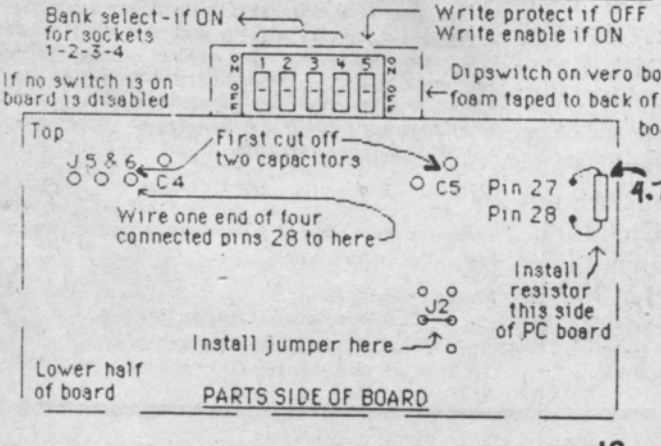
The board is now ready for rewiring.

Before wiring prepare the small piece of vero board, as shown,by cutting it to a size of 3/4" x1" and cutting the copper traces with a razor knife. Install and solder the dip switch to the vero board. Now, install a piece of double-sided foam tape 1/4"x1" to the space left below the dip switch body and set it aside.

Now comes the difficult part of the job. First install the four 28 pin sockets into the board 24 pin sockets with pins 1, 2, 27, and 28 hanging in the air at the top of the board. Seat them firmly and check that the socket tops are all aligned at the same height.

FIG. 1





Now your ingenuity, skill, and patience will dictate how you connect all four pins 2 together; then all four pins 27; then all four pins 28. This part will take the longest.

Now you must wire pins 28, at one end to J-6 as shown and at the other end wire in a 1/8 or 1/4 watt 4700 ohm resistor between pins 27 and 28. The worst is now over.

Now is the time to mount the piece of vero board to the back of the Hunter board, centered at the top and with the switches facing you when the board is plugged in. The foam tape will hold it in place during the wiring and when completed and tested you can epoxy the edges of the vero board to back of the PC board.

The balance of the wiring is easy and makes the connections between the dip switch and the decoder pins and the bottom donut ofJ-2. Figure 1 shows the connections to make.

On the back of the Hunter board install the four .1 ceramic caps

between pins 24 and 12 of each original and the work will be done.

Install the 6264 IC's in the four 28 pin sockets, plug in the board, and turn on the computer. If the cursor appears so far so good. Push the No. 1 dip switch to "ON" and the write protect switch to "ON". Enter the test program:

```
10 FAST
20 FOR N=8192 TO 16383
30 POKE N,255
40 IF NOT PEEK N=255 THEN STOP
50 NEXT N
60 FOR N=8192 TO 16383
70 POKE N,0
80 IF NOT PEEK N=0 THEN STOP
90 NEXT N
100 STOP
200 FOR N=8192 TO 16383
110 PRINT PEEK N;
120 NEXT N
130 STOP
```

Run the program. It will take over 3 minutes and will come up with a 9/100 error code if all is well. Then enter GOTO 200 and the screen will come up full of zeroes in 10 seconds. If you press CONT and ENTER eleven times you will see an error code of 9/130 and a final half screen of zeroes.

The completed test verifies that No.1 RAM is OK. Now switch dip switch 1 to OFF and 2 to ON and repeat it to check socket 2. Do the same for sockets 3 and 4 and if all test OK you are in business with 32K of bank switched 8-16K NVRAM.

Since the 8-16K area of RAM can handle machine code, data or program material, you can use up to 8140 Bytes using the machine code transfer routines in the last pages of the Hunter instruction manual. This will give you instant access to often used programs (faster than discs). All machine code routines such as 4K Delphic Toolkit, the Berch Compiler and Run/Time package, Quick/Load, etc. can all be called instantly with a RAND USR entry from BASIC.

It is a tribute to the very thoughtful design that Paul Hunter put into his NVRAM board that it can be so easily configured to other uses.

TSH

CLASSIFIED ADS

FOR SALE: Two ZX81 Computers. One with seperate keyboard, two16 K Rampacks, all power supplies and connecting cables, one 2-ft. ribbon cable and connectors, 10 software tapes, old Sync magazines and TS magazines, etc. All for $150 (postage paid) or best offer. Szymkowiak, 1166 Cedar Ave., Shadyside MD 20764.

FOR SALE: TS 1000's, $10. each. These have been tested and work. No manuals or power supplies. Dean Miller, 29324 Park St., Wickliffe OH 44092. (216) 944-8630.

Have several Timex and Sinclair computers and some miscellaneous hardware. Large amount of software, books and magazines, etc. Would like to sell. S.A.S.E for complete list. Everything one of a kind and cheap. Arthur Brady, 132 Hilldale Rd., Dobbs Ferry, NY 10522.

TIMEX 2068 and Spectrum personal software collection sell-out. Many titles to chose from including games and utilities. Will consider swapping for your software. Send S.A.S.E. for listing to: John McMichael, 1404 S. Black St, Bozeman MT 59715.

Pictures from the

1986 Midwest TS Computer Fest

These pictures were taken and provided to TS Horizons by the kind permission of Charles Dickson of Lanham, Md.

Hilda Burt, left, and Carol Davis, members of the Computer Fest organizing committee, spent almost 48 continuous hours operating the registration desk at the Fest. (Husbands Tom Burt and Frank Davis were also prime activists for this event.)

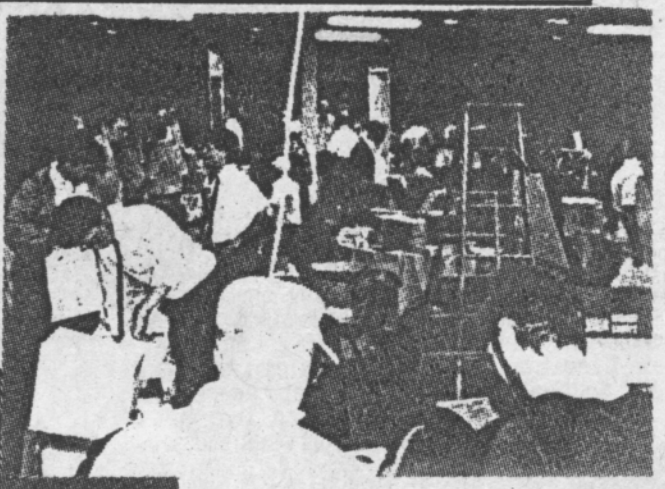
From left, Ruth Fegley, Maryland, Jeff Moore, Ohio, Tom Bent, Maryland, and Tom Woods, New Hampshire, represented SYNCWARE NEWS' interest at the Sharonville Sinclair conclave.

Genial Bill Russell (RUSSELL ELECTRONICS) of Centre Hall, PA was seen demonstrating the peripherals for the Sinclair QL. He also reported phenomenal trade in other TS items.

This was the view from the southeast corner of the room. In the foregound is the booth for the CTM magazine and in the front of that the table run by the Cincinnati users group. Lucy Gordon, co-author with husband Randy, of TS Tinyboard and other programs that they shared at the Computer Fest, is seen here in the lower center.

Pictures from the

1986 Midwest TS Computer Fest



View from the north end of the room. This picture indicates the number of size of the crowd in attendance at the Fest.

View from the southeast corner. John Coffey of JRC Software is seen here in the center of the picture manning his booth.

This view is from the northwest corner, as you enter the Computer Fest, again showing the turnout.

Finally, a shot of one of the many successful seminars conducted at the Fest in a seperate conference room. Randy Gordon of Cincinnati held this popular talk on telecommunications. TSH

Switchable Spectrum ROM Project for the TS 2068

by Gary Lessenberry

[Ed. note: We at TS Horizons have not yet tried Mr. Lesenberry's modification to verify it. As always neither TS Horizons nor the author can assume any responsiblility for damages that may arise from use or misuse of the following article. It certainly seems to be an elegant solution, but a delicate operation.]

I recently purchased some Spectrum ROMs from Zebra Systems with the hope that I might be able to make my own "ROM-switch" circuit without having to pay the price of those that are commercially available. When I examined the TS-2068's ROM circuitry, I realized that this was an easier task than I had originally assumed! All that I needed was: a Spectrum ROM, a toggle switch, two feet of insulated wire and two 10K ohm resistors.

To start the project, you first remove the top from your computer by removing the screws on the bottom of the case. When you look inside, it will appear as in figure A. You now remove the Timex ROM (U16). To remove it, gently pry it with a small screwdriver or knife inserted between the socket and the ROM.

With your Timex ROM removed, you place your Spectrum ROM directly over your Timex ROM with the notches in the same direction. There should only be a thin space between the two ROMs and all of their leads should be touching. Do not have a lot of space between these ROMs because clearance is critical when you re-assemble your computer! You will now, very gently, bend pin 20 on both ROMs outward until they are perpendicular to the other pins.

resistor will be soldered to pin 28 (+5vdc). The other end of the two wires that you have coming from pin 20 of the two ROMs will be soldered to the toggle switch. The toggle switch has three pins on it. Two of these pins are labled "ON". Solder one wire on each of these two pins. Another wire will be soldered on the middle pin of the toggle switch with the other end of that wire going to the circuit board and soldered to W1.

You may now solder all of the pins except pin 20. Be careful when soldering, allow about 30 seconds between the soldering of each pin so that you won't overheat and damage your ROMs. To pin 20, of each ROM, you will solder a piece of wire and one end of a 10K ohm resistor. The other end of each 10K ohm

At this point, you may reinstall your ROM in its socket. A hole must be drilled in the rear of your case for the mounting of your toggle switch. Once your toggle switch is installed, you may replace the top of your computer. Be careful when reinstalling the top of the computer to ensure that you have proper clearance and that nothing is being forced!

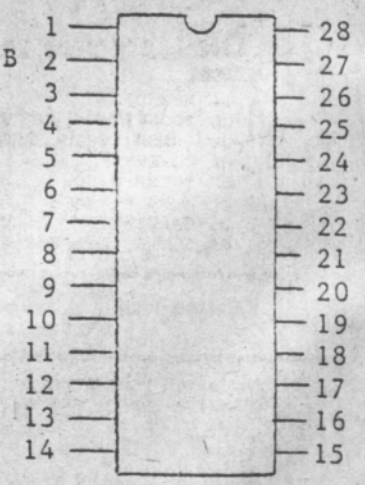
Once your computer is reassembled, you may test it out. You can tell which ROM is selected by the screen display after initialization. When in Spectrum mode, you will get the Sinclair copyright. When in 2068 mode, you will get both the Timex and the Sinclair copyrights.

TSH

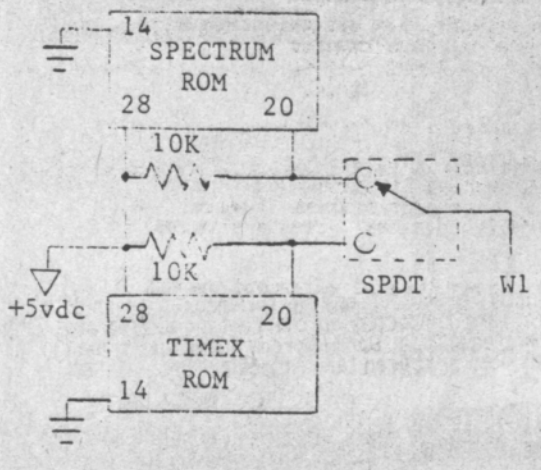
PARTS LIST

QTY	ITEM	SOURCE & CAT #
2	10K OHM RESISTORS	RADIO SHACK 271-1335
1	SPDT TOGGLE SWITCH	RADIO SHACK 275-6725
1	SPECTRUM ROM	ZEBRA SYSTEMS (no cat#)
2ft	STRANDED WIRE, 25 GAUGE	

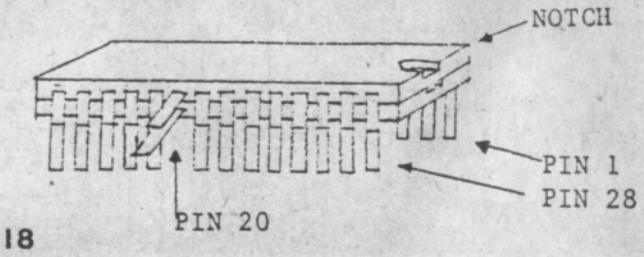
figure B



MODIFICATION SCHEMEMATIC



SPECTRUM ROM PIGGYBACKED TO A TIMEX ROM



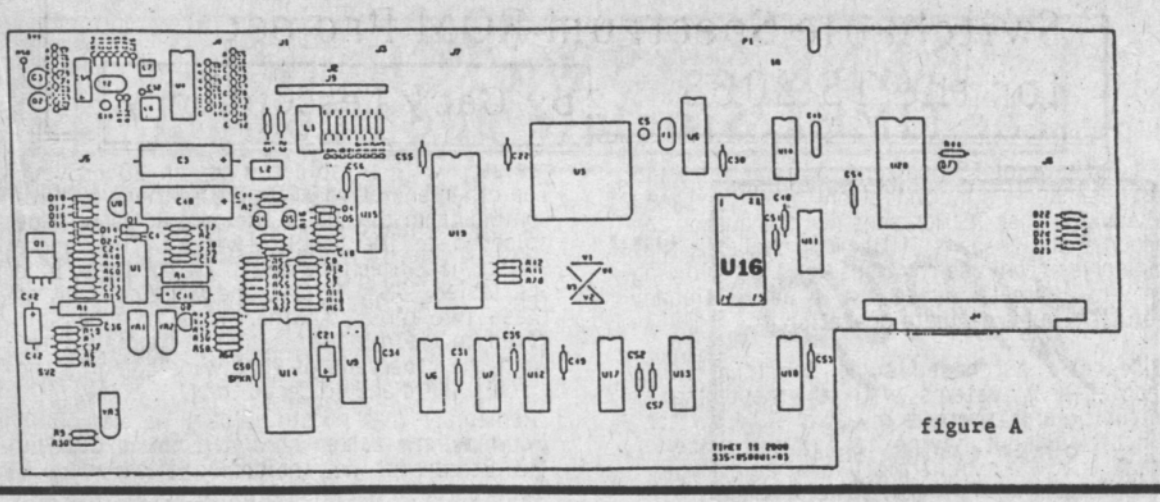


figure A

BANK ⟺ SWITCHING...
The TIMEX/Sinclair 2068 Computer

by William J. Pedersen

Part One

THE WIDJUP Co.
1128 MERRIFIELD s.e.
GRAND RAPIDS, MI 49507
©

What is bank switching?

The TS 2068 contains a thin black rectangular chip that is the "boss" - the Central Processing Unit (CPU). It is of the popular variety Z80A which has a long history of success. It runs just about everything but it takes orders from you.

The boss has a filing system in which there are 65,536 places to put things - every one at his "fingertips". Each place has an addres from 0 to 65,535. To help out all these places are "chunked" into eight file rooms. The rooms are called CHUNK 0 through CHUNK 7. Each contains 8192 palces.

CHUNKs 0 and 1 normally contain information you can't change. That is read-only-memory (ROM for short). What is normally in those two rooms is the HOME ROM. The other rooms are normally full of working files that can be changed, the HOME RAM (random-access-memory).

Business goes merrily on until you tell the boss to prepare a report on tape, which requires the services of EXROM.

"Where's EXROM?" shouts the boss.
"Across town, boss."
"Well, get it!"
"Yes, boss - er - where will I put him?"
"Hmmm - Kick HOME ROM out of CHUNK 0 and put EXROM there."
"OK boss - suppose we need HOME ROM again?"
"Then we'll get it back the same way, stupid."

The job of taping the company report is completed and HOME ROM is moved back into CHUNK 0.

Now that is what is called bank-switching. Is it so hard to understand? You have a limited number of CHUNKs, but you can change what is in them.

The EXROM is one example. The DOCK where you put plug-in cartridges is another . All others are called expansion bank units (EXBUs).

You might think that anything connected to the computer is an EXBU. However, many things are just connected to the phone lines, so-to-speak...the input/output (I/O). A buss expansion unit, a BEU, is not always an EXBU. Confused? To be an EXBU it must be able to move into a chunk. The 2040 printer can't even though it is a BEU. EXBUs require a special chip (or its equivalent) to communicate with the bank switching controller.

Remember that stupid helper? He was the one who did the actual bank switching. If he was told to switch out the chunk he works in, how would the boss ever get him back?

There are five choices:

a. Don't kick him out in the first place.
b. Make sure the EXBU has his replacement.
c. Use the telephone. (I/O)
d. Talk to ROM.
e. "Double talk" to memory.

Options a. and b. are bad; one mistake and all is lost. Option d. is bad because the chunk could have been RAM switched in.

That leaves options c. and e. The 2068 uses both, even though option c. would suffice. It is easy to understand using the I/O to contact the bank switching controller (BSC). It is not so easy to understand "double talk", so we'll explain that later.

This scenario might not have been needed by many of you, but a fresh viewpoint often causes a handslap to the forehead. From here on we get very technical. Be forewarned.

Now that you know what bank switching is, and some of its problems - let's review the I/O facilities of the 2068. "Review" is not really the right word because much of what is presented here is not in any better known book for the 2068.

To begin with, two I/O instructions will be expiained - CLOSE and OPEN. The simpler of the two is CLOSE. In the process it will be necessary to explain other instructions as they are met. In this way, an orderly presentation is possible. Random wanderings are avoided.

Figure 1 shows a flow chart for the operation CLOSE. It has two main branches; one for HOME use, the other for EXBUs.

It should be mentioned here that TIMEX produced 2068s with the EXBU branch disabled because they had not yet marketed (nor did they ever market) EXBU devices. Through judicious use of error trapping, this branch can be healed. Lesser treatments permit adding the Mikrodrive, but why settle for less than complete capability?

This also resulted in unresolved "bugs" in the bank switching code which would have been fixed if tested with EXBUs. Many are as

simple as a typographical error at 6610h in CALL_BANK, for which the cure is easy. The one at 0F48h in PASSIN is harder. Ideally the ROM should be replaced, but let's be practical.

The syntax of the CLOSE statement is:
CLOSE # [streamname]

[streamname] is a numeric variable or a constant which has a rounded integer value from 0 through 15.

A mnemonic is preferred because it makes more sense and can be reassigned without rewriting program subroutines. The integer value will be called STRM# hereafter.

The first block in Figure 1 is CALL OFFSET. OFFSET uses STRM# to compute an index into a table of offsets called STRMS. It gets two bytes in Z80 reg BC and returns with reg HL pointing there.

The 38 byte STRMS table is located in the system variables area @ 23568. Initially the table contains:

		BYTES		NORMAL USE	
STRM#	ADDR	(C)	(B)	(INPUT)	(OUTPUT)
-3	23568	1	0	KEYBOARD	LOWER SCREEN
-2	23570	6	0	(ERROR)	MAIN SCREEN
-1	23572	11	0	(ERROR)	RAM WRITE
0	23574	1	0	(KEYBOARD)	LOWER SCREEN
1	23576	1	0	INPUT COMMAND	LOWER SCREEN
2	23578	6	0	(ERROR)	PRINT/LIST
3	23580	16	0	(ERROR)	LPRINT/LLIST
4	23582	0	0	(User difined, initially closed.)	
..	.....	"	"	"	
15	23604	"	"	"	

STRM#s -3, -2, and -1 are "hidden"from access by BASIC. All the others can be changed to suit your own purposes. The reason for hiding them is to insure the computer is not denied access to the keyboard, space for reports, or space for autolisting.

The normal use is not sacred, but you should rarely need to use more than the 12 available assignable streams from 4 to 15.

Channels are real data paths between one computer section and another. They might be temporary, permanent, near, or far - but they are real.

Streams are arbitrary labels applied to channels as a convenience. They are not real - any more than the printed word is the real sound as spoken. They are, however, very convenient.

Now comes an interesting piece of information. The true offset is the lower 15 bits of reg BC. Bit 7 of reg B is a flag which indicates an EXBU is involved, when set.

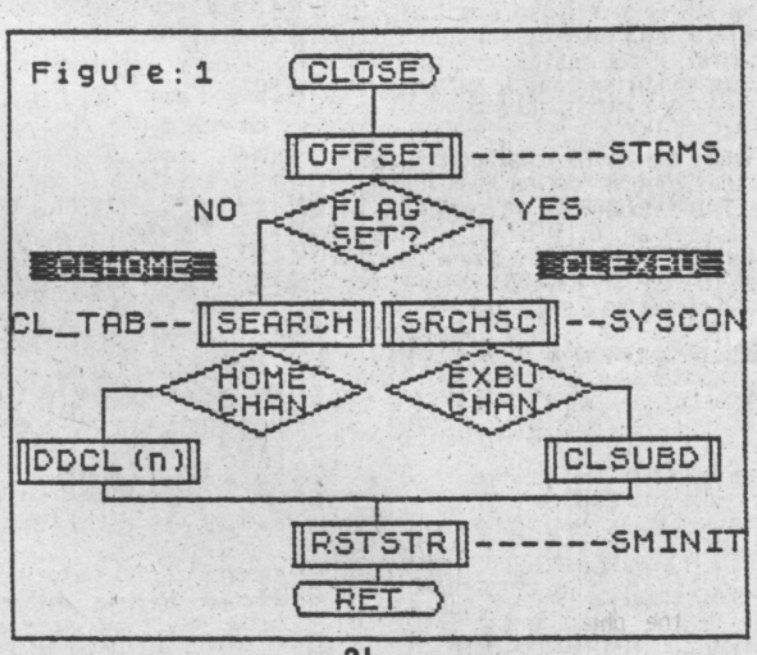
For EXBU streams, the offset is an index into the system configuration table (SYSCON).

For HOME streams, the offset minus one is used as an index into the CHANS table:

CHANS TABLE (INITIALLY)

CHAN#	ADDRESS	SUBADDR	VALUE	FUNCTION
1	26688	26688	1280	SENDTV (OUTPUT)
		26690	3086	IN_K (INPUT)
		26692	"K"	DEVICE SPEC.
2	26693	26693	1280	SENDTV (OUTPUT)
		26695	4543	ERROR
		26697	"S"	DEVICE SPEC.
3	26698	26698	2791	INSA (OUTPUT)
		26700	4543	ERROR
		26702	"R"	DEVICE SPEC.
4	26703	26703	1280	SENDTV (OUTPUT)
		26705	4543	ERROR
		26707	"P"	DEVICE SPEC.
ETB	26708	26708	80h	End-of-table marker
		26709	00h	Bogey byte
...	26710	Start of BASIC area		

Notice that channels 2 and 4 differ only in the device spec. Even though SENDTV is listed for 3 of the 4 channels, its operation depends on flags



defined by the device specifications.

One of the required functions of CLOSE is to reset any device dependent flags which could interfere with subsequent operation. An example of this is a table used to map the interrupt daisy chain for open devices.

That is why the CLOSE routine must look up the offset, read the device specifications, and execute any device dependent closing routines needed. Having done that it is time to rewrite the STRMS offset bytes.

The RSTSTR routine write 0's for STRM# 4 through 15. Otherwise it looks up the default values in the SMINIT table. This is the same table which was used to initialize STRMS.

Whew! The job is done.

"NOT SO FAST THERE, BUSTER!" comes a cry from the 2068 as its screen goes crazy.

A problem exists. It seems like one of those mistakes that can ruin the end of an otherwise perfect day, but let's keep cool.

It's like this. After taking great pains to make sure that CLOSE can execute device dependent close routines if needed, the CL_TAB table is unable to point to any but one @ 5133 that does nothing at all - and then only if the device spec is K, S, or P. Attempting to CLOSE a different device results in chaos.

It is pointless to continue until this fine kettle of fish is dealt with. This one is a "stinker". ON ERR GO TO doesn't work because no error is detected!

SEARCH is called with the address of CL_TAB in reg HL and the device spec cahracter in reg C. It looks at the first byte in the table. If it is 0, it signifies the end of the table. It can never be the first byte. If it matches the character in C, it returns with HL pointing to the folowing byte and condition code CY set. If it doesn't match, it skips a byte and starts over agian. Eventually it finds the end-of-table 0, providing a match has not been found first. It returns with HL pointing at the 0 and with condition code Z...but CL_TAB has no 0!

What happens when the device character is not found, is that the SEARCH routine keeps going; overrunning CL_TAB into OFFSET in search of a match or a 0. It sees an "8" @ 5143, an "O" @ 5153, and finally a "0" @ 5155. If our new device character is not "8", or "O", SEARCH will return with HL=5155 and condition Z set.

CLHOME fails to test the results of the search. It adds HL and the byte pointed to by HL. Then it jumps to that location. In case of K, S, and P, that location is 5133. No problem. The jump to 5155 is wild! It is in the middle of OFFSET, and also in the middle of an instruction.

Although the instructions are all wrong, nothing really damaging happens until the RET instruction is found @ 5161.

The intended return path @ 5133 POPs HL before RETurning. The wild branch doesn't. As a result it "returns" to the address in HL (left on the stack), which points to the STRMS offset bytes. There is no machine code there, just offsets...EUREKA! Bright flashing lights! Suppose we sacrifice two STRM#'s so we can put in a real jump instruction to the emergency ward? Might work!

To save a long explanation, it does not work, with the limitations that STRM#s 11 and 12 are sacrificed and 13 to 15 used for EXBU.

POKE 23596,0
POKE 23597,195
POKE 23598,Least significant byte of patch routine address.
POKE 23599, Most significant byte of same.

Of course, we have traded one problem for another, but isn't it worth it? There are other other patches needed to complete the fix, but we will wait until we meet them.

We were discussing CLOSE. Though HOME operations have been covered in detail, the EXBU branch has only been touched.

In the next installment, OPEN and the EXBU branches will come under scrutiny. We will also reveal the SECRET of why address lines A13 through A15 are the only ones buffered.

STAY TUNED TO THIS HORIZON!

TSH

```
    CL_TAB with overrun

 5127   75   "K"              5
 5129   83   "S"              3
 5131   80   "P"              1

    DDCL1  "Do nothing routine"

 5133   225                   201

    OFFSET

 5135   205                   30
 5138   31                    50
 5139   203                   92
 5141   56   "8"              2
 5145   207                   23
 5147   198                   3
 5149   7                     33
 5151   16                    92
 5153   79   "O"              6
 5155   0    "End-of-table."
```

```
        ASSEMBLER LISTING

4970  SEARCH   INC HL          !Skip offset byte
4971           LD A,(HL)       !Get byte
4972           AND A           !Set condition code
4973           RET Z           !Not found, end-of-table
4974           CP C            !Match?
4975           INC HL          !Point to offset
4976           JR NZ,-6        !4970 No match, try next
4978           SCF             !Here if found\Set CY
4979           RET             !Found
5023  CLOSE    CALL OFFSET     !5135 Returns HL->offset,BC
5026           LD A,B
5027           OR C
5028           RET Z           !Return if already closed
5029           CALL CLCHAN     !5054
5032  RSTSTR   LD BC,0         !RESTORE STRMS entry as closed
5035           LD DE,419E4
5038           EX DE,HL
5039           ADD HL,DE
```

```
50040          JR  C,+3            !5049 If STRM# > -3
50042          LD  BC,4559         !Here if STRM# = -3 thru +3
50045          ADD HL,BC
50046          LD  C,(HL)
50047          INC HL
50048          LD  B,(HL)
50049          EX  DE,HL
50050          LD  (HL),C
50051          INC HL
50052          LD  (HL),B
50053          RET
50054 CLCHAN   PUSH HL
50055          LD  A,B             !Get flag byte
50056          CP  128             !Is bit 7 set?
50058          JR  NC,+22          !60080 CLEXBU if set
50060 CLHOME   LD  HL,(CHANS)      !23631 Here if HOME channel
50063          ADD HL,BC           !Compute target chan CHR$ addr
50064          INC HL
50065          INC HL
50066          INC HL
50067          LD  C,(HL)          !Get device CHR$ from CHANS
50068          EX  DE,HL
50069          LD  HL,CL_TAB       !5127
50072          CALL SEARCH        !4971
50075          LD  C,(HL)          !Get pointer offset
50076          LD  B,0
50078          ADD HL,BC           !=5133 if found, 5155 if not
50079          JP  (HL)            !Device dependent close routine
50080 CLEXBU   SUB 128             !Reset bit 7
50082          LD  B,A
50083          LD  HL,(SYSCON)     !23740
50086          ADD HL,BC           !Compute addr of SYSCON group
50087          LD  A,(HL)          !Get status byte
50088          CP  0
50090          RET Z               !Return if already closed
50091          CP  128
50093          RET Z               !Return if SYSCON end-of-table
50094          INC HL
50095          LD  B,(HL)          !Get BANK#
50096          INC HL
50097          INC HL
50098          INC HL
50099          INC HL
51100          LD  E,(HL)
51101          INC HL
51102          LD  D,(HL)          !Get target addr CLSUBD
51103          LD  H,D
51104          LD  L,E
51105          LD  A,(STRMNM)      !23755 Get target STRM#
51108          LD  E,A
51109          LD  D,0
51111          PUSH DE             !Parameter=Target STRM#
51112          PUSH HL             !Target routine addr
51113          PUSH BC             !BANK#,MEMSEL (=XXXXX100)
51114          LD  BC,3
51117          PUSH BC             !Parameter bytes passed
51118          LD  BC,0
51121          PUSH BC             !Parameter bytes returned
51122          CALL CALL_BANK      !26064 EXBU chan close routine
51125          POP HL
51126          RET                 !to RSTSTR
-The SYSCON table status byte is set to 0 if it was open.
51127 CL_TAB   45h                 !="K"
51128          00h
51129          53h                 !="S"
51130          03h
51131          50h                 !="P"
51132          01h
51133 DDCL1    POP HL              !Here if permanent channel
51134          RET                 !to RSTSTR
51135 OFFSET   CALL FIX_U1         !7966 Get STRM# from calc stack
51138          LD  (STRMNM),A      !23755 Save it
51141          CP  16              !Max STRM#
51143          JR  C,+4            !5147
51145          RST 8
51146          17h                 !Error C:Invalid stream
51147          ADD A,3             !Add 3 to STRM#
51149          RLCA                !Multiply A by 2
51150          LD  HL,STRMS        !23568
51153          LD  C,A
51154          LD  B,0
51156          ADD HL,BC           !Compute addr in STRMS
51157          LD  C,(HL)          !Get lsb of offset
51158          INC HL
51159          LD  B,(HL)          !Get msb of offset and EXBU flag
51160          DEC HL
51161          RET                 !Returns HL->offset,BC
51162 OPEN     CP  44              !=",".\Implies MEMSEL follows
51164          JR  Z,+7            !5171
51166          CALL END?           !6980
51169          JR  +13             !5182\Here if not END
51171          CALL INTPT?         !10377
51174          JR  NZ,+8           !5182\If execute
51176          CALL &KIPIT         !9577\Blockade prevents execute
51179          CALL END?           !6980
51182          RST 40
51183          01h                 !Calc:S,T->T,S
51184          38h                 !Calc:Return control to CPU
51185          CALL OFFSET         !5135\Returns offset in BC
51188          LD  A,B
51189          OR  C
51190          JR  Z,+24           !5214
51192          EX  DE,HL
51193          LD  HL,(CHANS)      !23631
51195          ADD HL,BC           !Compute addr in CHANS
51197          INC HL
51198          INC HL
51199          INC HL
52200          LD  A,(HL)          !Get "d"
52201          EX  DE,HL
52202          CP  75              !="K"
52204          JR  Z,+10           !5214
52206          CP  83              !="S"
52208          JR  NZ,+6           !5214
52210          CP  80              !="P"
52212          JR  NZ,-67          !5145\Error
52214          CALL OPCHAN         !5221
52217          LD  (HL),E
52218          INC HL
52219          LD  (HL),D
52220          RET                 !to BASIC
```

REVIEWS:

Review: HACKER'S HANDBOOK
by Bill Ferrebee
Mountaineer Software

TITLE: HACKER'S HANDBOOK
SUBJECT: Telecommunications
COMPUTERS: ALL(Including TS1000 ZX81and TS 2068)
PRICE: $12.95
AVAILABLE FROM:
E. ARTHUR BROWN
3404 Pawnee Dr.
Alexandria MN 56308

There is a revitalized interest in T/S telecommunications recently. Westridge modems and modem boards are available at very moderate prices. MTERM II enhancements and new advanced software is available for all T/S computers. An expanded manual for MTERM II has cleared up many questions.

And...for those who dare to go farther...for those who aren't satisfied just to call a bulletin board or Compuserve...there is the HACKER'S HANDBOOK!

The HACKER'S HANDBOOK is written by Hugo Cornwall (an alias?) of England. In this book, Hugo goes into detail of what goes on in the mind of a true "hacker", one who revels in the ability to break into the most secure computer systems. He starts in very simple terms, and describes the subject in language everyone can understand.

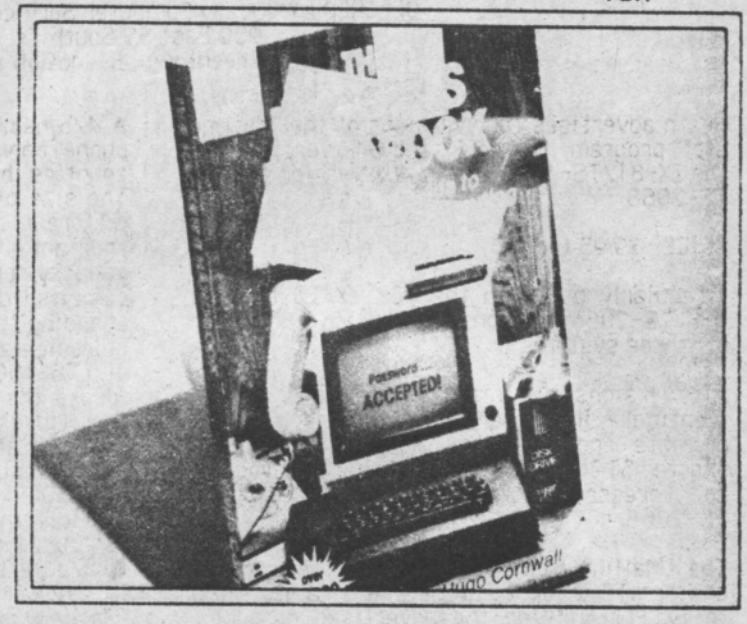
This book is a very complementary one to "The Inner Circle", written by Bill Landreth of the famous "414s".

Although this book was written in England, it goes into great detail of the American system of telecommunications. Filled with appendices, HACKER'S HANDBOOK is one great reference manual to keep beside your modem. I couldn't put it down! I read it every chance I got until I finished the entire book. And I find myself refering to it whenever I try a new service.

HACKER'S HANDBOOK is a definite must for any modem-crazed computerist, since it is not a machine-specific book. Beware...if you buy a copy, and your friends see it, it won't be in your hands for long.

HACKER'S HANDBOOK belongs on any computer bookshelf, right beside your owner's manual. That is, AFTER you read it all!

TSH



SOFTWARE REVIEW
by Bill Jones

Applicable to: TS-2068, TS-1500, TS-1000
MEMORY: 16K, 32K, 48K, or 64K
TITLE: MAILING LIST
OFFERED BY: Heath Computer Services
950 East 52 South
Greentown, IN 46936

Heath advertises four versions of the "Mailing List" program; 16K, 48K, and 64K versions for the ZX-81/TS-1000, and a 48K version for the TS-2068.

PRICE: $9.95 (each)

I regularly use both the 48K ZX/TS and the 48K TS-2068 versions of "Mailing List" with my three systems.

All versions of this software are almost identical in program structure, screen prompts and operation. The difference is shorter STRING DIMENSION of the 16K program and "dressed up" color and sound for the TS-2068.

The "Mailing List" programs for both ZX/TS and for TS-2068 computers are rated "GOOD to EXCELLENT" for the advertised purposes, and there is a bonus that we will discuss later.

Following are the significant features of this program:

The program is written entirely in BASIC language. It stores from 100 to 425 NAMES, ADDRESSES, and PHONE NUMBERS; Lists all names; Searches by NAME, by CITY, by ZIP code, or by PHONE number. It allows changes to entered data, or deletions of data. It allows a print out of the complete listing, or a single entry, or a listing of names only. It automatically prints by name and address to the 2040 printer. Use this feature to print, on a single run, mailing labels for up to 425 customers, on a roll of 2040 mailing labels. And you can break the program, and adjust spacing of the print blocks to fit the spacing needed to print the labels. It sorts all listed data by Name, by City, or by ZIP CODE. It searches and displays data by Name, by City, by ZIP CODE, or by Phone number.

All of the above functions are accomplished quickly and efficiently except the SORT function, which is very slow. I do not consider slow sorting to be a real flaw, because one only needs to sort once after the listing data is entered.

I experienced easy loads of the cassettes in three computers. The program comes up running automatically, but is easily broken for user modification (The Bonus). Entry of data is smoothly accomplished, and screen prompts are so efficient that the one page of instructions is hardly needed at all to understand and begin using the software.

A 425 name listing is quite a large "computer phone book". Many small towns, and some counties have fewer telephone subscribers. The size of your telephone list needs may be different and you may need to modify the program's "STRING DIMENSIONS" to reduce memory requirements. This can easily be accomplished by breaking the program and changing the string dimensions to fit your requirements. I wanted to use the program with my TS-1500. I tagged on a 16K ram, and loaded the tape (a 48K version). It wouldn't run (insufficient memory). I broke the program and reduced the dimensions of the string variables. Viola, a 32K version for the TS-1500! Next, I revised the program to an "Article Index". Now, I have 300 magazine articles indexed by title, author, and publication/date/page. Now, isn't this a good bonus?

"Mailing List" is a good bargain. Support your ZX/TS software industries. We need them, and they need us. We will all hang together, or each may be left hanging separately. **TSH**

Designer Tips
For the Zebra Designer Series

by Bill Ferrebee

BANNER, GREETING CARD, and SIGN DESIGNER are programs that give us the chance to be a little creative, and make even more constructive use of your 2068.

After spending much time with all three programs, I have come up with a few suggestions to make your final product even MORE impressive.

- First, try putting graphics in random spots on your greeting card or design, instead of just the four corners or the middle.

- Next, always be on the lookout for ideas for new graphics. I did, and I now have over 75 different ones besides the original 22 that come with the programs.

I am sharing some of them with you each month here in TS HORIZONS. If you have some favorites you've designed, send them to me at:

Bill Ferrebee
MOUNTAINEER SOFTWARE
749 Hill St. #6
Parkersburg WV 26104

We might print yours in a future issue!

- The most important tip I can give you is to use COLOR. This can give your final product pizzazz, and it is not hard to do. There are 3 ways to use color:

1) Colored Paper
2) Colored Ribbons
3) Colored Markers

Review: SIGN DESIGNER/
BANNER DESIGNER
by Bill Ferrebee
Mountaineer Software

Programs: SIGN DESIGNER
BANNER DESIGNER
Price: $19.95 each.
Computer: TS 2068 (80-col. printer req.)
Available from:
ZEBRA SYSTEMS, INC.
78-06 Jamaica Av.
Woodhaven, NY 11421

DREAMS DO COME TRUE! There IS someone out there that listens to our requests.

In the last issue, I reviewed GREETING CARD DESIGNER from ZEBRA SYSTEMS. The program enables you to custom design and print your own greeting cards, announcements, mini-signs, etc., on the TS 2068. The ease and quality of the results made me feel that Zebra had wrapped up the "Program of the Year" honors for the second year in a row.

I also stated that I hoped that Zebra would release more "Print Shop"-like programs. I could envision printing banners, signs, letterhead,...

...and Zebra has come to the rescue...with SIGN DESIGNER and BANNER DESIGNER! Now you can design and print greeting cards, signs, and banners with your 2068 and full-size printer.

The quality of SIGN and BANNER equal that of GREETING CARD DESIGNER. Commands are identical for all three progams. With the GRAPHIC DESIGNER UTILITY (provided with each of the three programs), you can design your own graphics that are interchangable among programs.

Use the SIGN DESIGNER to produce signs, covers for reports or newsletters, notices and more. With BANNER DESIGNER make banners for displays, birthdays, anniversaries,...you are limited only by your imagination.

Now I have a three-way tie for "Program of the Year"... SIGN DESIGNER...BANNER DESIGNER...and GREETING CARD DESIGNER!

ZEBRA has done it again! TSH

Colored paper is available in continuous form-feed from many office supply stores. You can also order it from the paper supplier for PRINT SHOP for IBM and Apple:

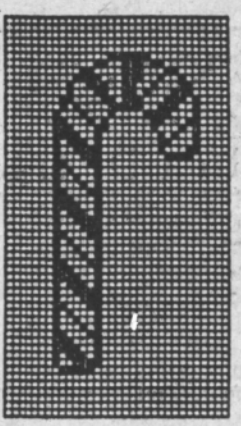
PIXELLITE COMPUTER PRODUCTS, INC.
5221 Central Ave., Suite 205
Richmond Ca 94804
1-800-643-0800

Colored ribbons are available in a variety of colors (Red, Blue. Green, Purple, Brown, and Yellow) for all of the printers supported by the DESIGNER program series. A good source for the ribbons is:

PRINTER RIBBON SUPPLY
P.O. Box 920145
Norcross GA 30092
1-800-438-7745
(Mention this article when you call.)

The next suggestion is the easiest and most economical. When you design your product, use "outline" letters. Then simply color them in with brightly colored felt tip markers. (Be sure to stay in the lines!) Many times you can buy an assortment of 24 or 48 different markers for under $5.00.

- My final suggestion is...experiment! Don't be afraid to try something new. It's only paper and who knows, you might become the next Hallmark! **TSH**



GRAPHIC DESIGNER

cdycane

```
Control Keys
p=Plot   o=Unplot
CS/s=Store graphic
CS/c=Clear graphic
CS/x=Exit
CS/p=Copy screen
Arrow keys to move
ENTER=Next line
```

GRAPHIC DESIGNER

dove

```
Control Keys
p=Plot   o=Unplot
CS/s=Store graphic
CS/c=Clear graphic
CS/x=Exit
CS/p=Copy screen
Arrow keys to move
ENTER=Next line
```

XModem on the TS 2068!

Loader V- for use with 2068, 2050 modem, and MTERM II software.

New featues include:

* XModem error checking protocol
* Auto-repeating dialer...speeded up dialing
* Extra 20 number dialing directory...set parameters for each number!
* Loads Mterm's buffer with any standard "Bytes" file!
* Loads text files from Tasword II or Mscript for up/downloading!
* Insert carriage returns after every line, paragraph, or not at all in Tasword II files!

*** INCLUDED FREE...**

* Re-Loader- reload Mterm's buffer while still on line!
* Un-Loader- convert contents of Mterm buffer (whatever was downloaded) so it can be used as a text file in Tasword II. Instructions for using Mscript with downloaded files included!
* Uploading routine seperate from Mterm's...allows uploading to sytems that have a fixed line length (Mterm will not do this!)

All the above, for super telecomputing on the 2068, available now for only.... **$12.95 postage paid!**

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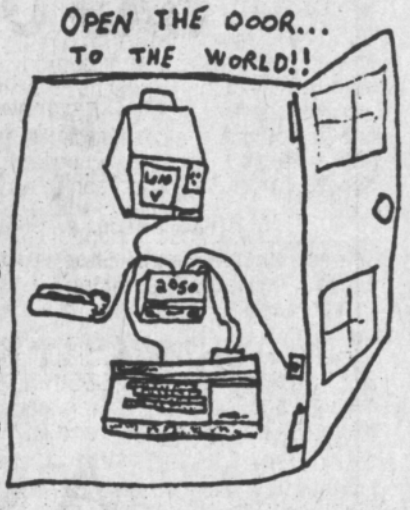

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inQLings

inQLing: Software from France.
Curry Computer is now the U.S. distributor for Pyrimide Software of Paris, France. Pyramide has just released WANDERER a 3D program, their first for the QL. With 3D glasses and an RGB monitor, Curry claims, the "effect is so realistic that if you reach out and [attempt to] "touch the display with your hand, it will be another four to five inches before your fingers touch your screen." The program was reviewed in the British magazine ***Sinclair User***, and given the "Sinclair User Classic" award.

Other titles from Pyrimide include Nucleon, a utility package with drawing, music, window, icon development, and character generation programs; QL Peintre, a full-color Macpaint-type program; VROOM, Pole-Position-type auto-racing game; and Mortville's Manor, atext and graphics, mystery adventure game. For more information . For more information contact Curry Computer, P.O. Box 5607, Glendale AZ 85312-5607, (602) 978-2902. Tell them TS Horizons sent you.

inQLing: Software from Turkey.
We recently received a letter from Oguz Nur, M.Sc., C.E., in Istanbul, Turkey. He has developed a line of "high quality professional software" for the QL.
1. Project Management Program - for Executives of Construction Companies.
2. Two-Dimensional Structural Frames (Statistical Analysis) - for frames of various configurations and loadings, yields forces on members, etc.
3. Three-Dimensional Structural Space Trusses (Stat. Anal.) - similar to 2. above.
For more information contact: Oguz Nur, Software Atelier, P.O. Box 148, 80002 Karakoy, Istanbul, Turkey.

inQLing: A new QL publication.
Syncware News has decided that the time is right for a new publication devoted to the QL only. "Quantum Levels" will be published bimonthly, beginning in June or July, and will carry QL ads and articles. Tom Bent will be the editor. They expect a minimum of 1000 subscribers for the first issue. (Good Luck!) SWN, P.O. Box 64, Jefferson, NH 03583, (603) 586-7734.

inQLing: Of course there's always the original U.S. QL newsletter, the "QL Report" from Curry Computer. And they can put you on the track of several QL-supporting publications in the U.K. as well. See address elsewhere in **inQLings.**

inQLing: Languages for your QL.
Metacomco has introduced several programming packages for the QL. **Lattice "C"**: "the most powerful and fully featured C

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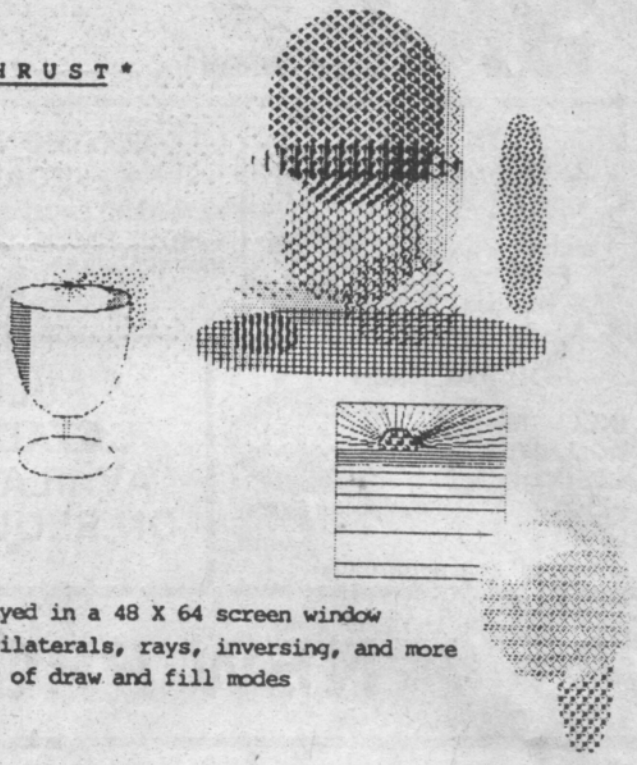
THRUST



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SINCARTIST 1.3 - The original! Fantastic hi-res graphics delivered to the 2040 printer. SincArtist 1.3 boasts excellent user-group reviews and is simply the best non-hardware system available. Note these features:

- 192 X 256 high-resolution file displayed in a 48 X 64 screen window
- Circles, triangles, rectangles, quadrilaterals, rays, inversing, and more
- 40 redefinable patterns and a variety of draw and fill modes
- Cursor or joystick control
- No system modifications required

SINCARTIST HR - The last word in cursor-controlled high-resolution screen graphics. Copy artwork to the 2040 printer and save to tape. SincArtist HR requires a TS 1000 with a socketed 2K RAM, less than $10.00 in parts, and a few minutes with a soldering iron. Super user-friendly documentation and instructions included. All modifications are fully transparent to other peripherals. HUNTER BOARD OWNERS: All you need is the FREE hardware upgrade that we provide!!!!!

THRUST includes SincArtist HR and Sinc-Artist 1.3 (these programs are not sold separately). The Ultimate Hi-Res Tape is available exclusively from Weymil Corporation for only $20.

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